



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Yang Gao
Serial No.: 09/761,033
Filed: January 16, 2001
Art Unit: 2655
Examiner: Jackson, Jakieda R.
Title: System for an Adaptive Excitation Pattern for Speech Coding

DECLARATION UNDER 37 C.F.R. § 1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir/Madam:

I, Yang Gao, declare as follows:

1. I am the inventor of the subject matter described and claimed in the above-referenced United States Patent Application Serial No. 09/761,033, filed January 16, 2001, entitled "System for an Adaptive Excitation Pattern for Speech Coding," which claims priority to Provisional Patent Application Serial No. 60/233,042, filed September 15, 2000.

2. I declare that I conceived invention of the subject matter of the above-referenced application in the United States, as defined by its pending claims 28-29, 31-35, 38-39, 41-45, on or prior to September 1, 1998.

3. To evidence conception of invention of the subject matter of the above-referenced application in the United States, attached hereto, please find a copy of the Innovation Disclosure describing my invention having Docket No. 98RSS366, entitled "Adaptive Excitation Pattern for Low Bit Rate Speech Coding", which was entered into Rockwell Semiconductor Systems, Inc.'s Innovation Disclosure Database on September 1, 1998.

4. I declare that the enclosed Innovation Disclosure evidences conception of invention of the subject matter of the above-referenced application in the United States on or prior to September 1, 1998.

5. I declare that the contents of sections 1, 4, 5, 6 and 7 of the enclosed Innovation Disclosure were not revised and remained unchanged after the entry date of September 1, 1998, as indicated in the enclosed Innovation Disclosure.

6. I declare that the present invention, as defined by claims 28-29, 31-35, 38-39, 41-45 pending in the above-referenced application, was reduced to practice at Rockwell Semiconductor Systems, Inc. (which changed its name to Conexant Systems, Inc.) in the United States at 4311 Jamboree Road, Newport Beach, California 92660, on or prior to September 1, 1998, using due diligence after conception of invention of the subject matter of the above-referenced application.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine of imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-referenced patent application or any patent issuing thereon.

Dec 6, 2004
Date

Yang Gao
Yang Gao



Docket No.: 98RSS366
Ranking: FILED

1. Title of Innovation

Input a short title for the innovation

Adaptive Excitation Pattern for Low Bit Rate Speech Coding.

2. Division/platform Information

MSA

3. Innovator(s)

Name	Innovator Information				
Yang Gao	<table><tr><td>Personal Information : Home Address : State : Phone : Country of Domicile :</td><td>City : Zip : Fax : Citizenship :</td></tr><tr><td>Conexant Contact Information : Address : State : Phone : Email : Mail Code :</td><td>City : Zip : Fax : Dept. : Supervisor :</td></tr></table>	Personal Information : Home Address : State : Phone : Country of Domicile :	City : Zip : Fax : Citizenship :	Conexant Contact Information : Address : State : Phone : Email : Mail Code :	City : Zip : Fax : Dept. : Supervisor :
Personal Information : Home Address : State : Phone : Country of Domicile :	City : Zip : Fax : Citizenship :				
Conexant Contact Information : Address : State : Phone : Email : Mail Code :	City : Zip : Fax : Dept. : Supervisor :				

4. Problem Solved

Describe the problem or need solved by your Innovation. Try to identify when the problem or need was originally identified. What led to the problem or need, or how did it develop?

In CELP speech coding, it is known that pulse-like excitation can provide better quality for voiced speech than noise-like excitation while voiced speech is perceptually more important than unvoiced speech. However, at lower bit rate we have not enough bits to code enough number of pulses for the excitation. Too few number (for example, 2 pulses with low position resolution) of pulses for the excitation could result in poor quality because the excitation is not enough rich.

5. Previous Solutions

Describe how others solved the problem before you, so far as you are aware. List any patents, published articles, prior products, etc. that represent these prior efforts at solving the problem that you solved. More number of pulses for the excitation are used to keep high quality speech so that the bit rate should not be too low.

6. Solution

Summarize your idea, including a concise explanation of how your idea solves the problem. It is important that you provide a concise summary of your Innovation within this section, so that the disclosure form can function as an abbreviated source of information about your Innovation.

To improve the excitation quality, LT (Long-Term) correlation in the excitation has been explored, not only for the LTP excitation, but also for the fixed codebook (FCB) excitation. We found there exists also significant ST (Short-Term) correlation in the excitation, which can be used to improve the speech quality at lower bit rate efficiently.. Using the past synthesized excitation weighted by a current quantized weighting filter is one of the most efficient ways to estimate ST correlation (to search for an excitation pattern) without spending one bit. The searching algorithm can be similar to that for LTP where usually one lag with the gain needs to be estimated. To evaluate ST correlation with a typical subframe size equal to 40 samples, we typically search for 5 short lags ($l < \text{lag} < \text{subframe size}$) and gains by maximizing the correlations of the just past weighted excitation. Suppose we got 5 lags and gains: $T_i, G_i, i=1,2,\dots,5$; the excitation p_l pattern can be constructed as

See Figure 1

where a typical value of the coefficient C is between 0 and 0.5 ($0 < C < 0.5$), which could be a constant or an adaptive value related to the dispersion of the impulsive response of the current synthesis filter. Because the excitation pattern could cover the LT correlation when the pitch lag is shorter than the subframe size, LT harmonic enhancement gain for the FCB excitation should be multiplied by a factor $(1-C)$.

If you would like to include diagrams or other descriptive matter, please paste them here (cut and paste MS Word graphics or use separate graphics software). If you cannot do this electronically, you will have another opportunity to attach existing descriptive matter, such as journal articles, an IR&D write-up, etc., later in the innovation disclosure process.

$$P(n) = C \sum_i G_i \cdot \delta(n - T_i) + \delta(n)$$

Figure 1

7. Differences/Advantages Over Previous Solutions

Specifically identify the differences between your Innovation and previous solutions. What is new about your solution with respect to what is known in the art. What advantages(s) do the differences in your Innovation give your Innovation over the prior solutions? (Is it faster, smaller, cheaper, easier to manufacture, easier to test, use less power, perform a function not performed before, performs a function at a level not previously achieved, etc.) List and explain as many as you can.

The quality of our AMR 5.2 kbps speech codec is significantly improved by using this invention.

8. Status of Innovation

Indicate the extent to which your Innovation has been developed, e.g., is it a mental concept (idea) or have you done some laboratory work to prove that it operates as intended?

If "Other", please specify It is a new idea with a proposed algorithm.

9. Product or program in which innovation will be used:

Indicate any applicable product or program, existing or prospective, and any IICo Platform(s) which are interested in the Innovation. or which are likely to be interested, in view of their relationship to the technology area of the Innovation.

Products Used :	Technology Used :
If other, please specify :	If other, please specify :

Additional Information :	AMR project, TQV30; ITU 4kbps codec.
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10. Has anyone disclosed or does anyone plan to disclose your innovation outside the Company?

Identify any disclosure, whether in print, orally, or otherwise, outside of IICo such as, e.g., publication in a journal article, presentation at a conference, discussion in a contract report, etc. It is important to inform the Legal Department of any such disclosure as it may establish a deadline for filing a patent application.

If "Yes", where: and when (MM/YYYY)

11. Has anyone proposed or does anyone plan to propose a product or program to a customer which includes your innovation?

List any activity, past, present, or future, such as a proposal or a presentation to or discussion with a potential customer, which might produce income for IICo. Again, this information is important because it may impose a deadline for the filing of a patent application.

If "Yes", where: AMR competition (submitting in May 1998). and when (MM/YYYY)

12. Innovator signature(s): (Do not use black ink)

(YANG GAO) **Date :** _____

Qtr Evaluated: 4Q98
Group: MSA
Technology: Speech Compression
Sub Technology 1: Pre-Processing
Sub Technology 2:
Products:
Innovation Block:

Entered: Donna Bastedo/USA/Conexant @ 09/01/1998 10:48:38 AM
Modified: Joanne K Reitan @ 11/23/2001 08:56 AM

Revision History:

Revised: 10-Sep-1998 03:37 PM by James K Dawson
05-Jan-1999 02:52 PM by Donna Bastedo
24-Feb-1999 05:16 PM by Donna Bastedo
28-Mar-2001 01:15 PM by Joanne K Reitan
23-Nov-2001 08:56 AM by Joanne K Reitan